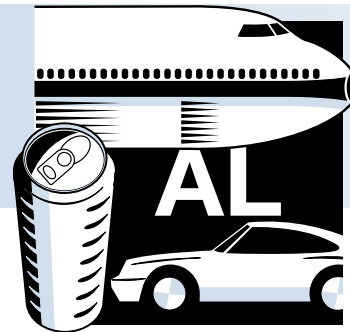


ALUMINUM

Project Fact Sheet



ADVANCED ANODES AND CATHODES UTILIZED IN ENERGY-EFFICIENT ALUMINUM PRODUCTION CELLS

BENEFITS

- Possible energy savings of six trillion Btu annually in the U.S. by 2010 because of the improved performance of the Hall-Héroult cell
- Elimination of carbon and fluorocarbon emissions
- Reduction of cyanide formation and dust emissions
- Potential energy costs saving of \$90 million annually in the U.S. by 2010
- Potential non-energy savings of \$20 million annually in the U.S. by 2010

APPLICATIONS

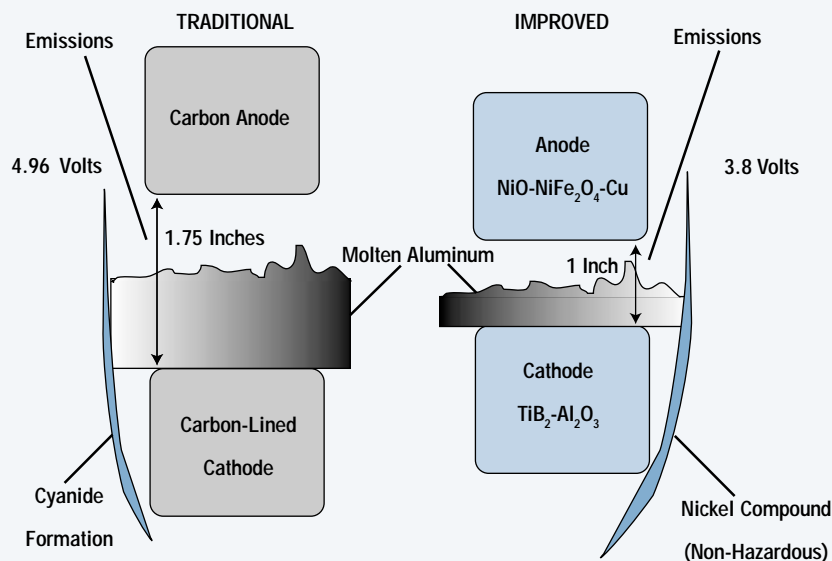
This improved primary aluminum smelting technology has application for new and retrofitted traditional Hall-Héroult production cells.

NEW ALUMINUM PRODUCTION CELLS WILL REDUCE ENERGY REQUIRED FOR SMELTING

For over 110 years, the aluminum industry has relied on the traditional (and energy intensive) Hall-Héroult process for aluminum smelting. With the recently developed advanced materials used for anodes and cathodes, it may be possible to significantly reduce the anode-cathode distance and, thus, reduce the energy required for aluminum smelting. Annually, over four million tons of aluminum are produced by smelting by the U.S. aluminum industry. More than 63,000 British thermal units (Btu) per pound are consumed in the process. Using the improved, more energy efficient process, smelting plants may be able to cut their energy use by 25 to 30 percent or more. These savings would contribute significantly to improving the economic competitiveness of the U.S. aluminum industry.

The Alcoa Technical Center will demonstrate the commercial viability of the design of an energy efficient/high productivity aluminum smelting cell that uses an oxygen producing anode and a cathode material that is wetted by aluminum. The combination of these two technologies provides a dimensionally stable inter-electrode distance, which can be used to greatly improve both the energy and productivity efficiencies of the Hall-Héroult cell. This project addresses advanced development of primary aluminum production defined in the *Aluminum Industry Technology Roadmap*.

ALUMINUM PRODUCTION CELLS



Aluminum production cells: traditional design versus improved design -- resulting in the reduction of dust, fluorides, effluents, cyanide and sludge formation, sodium and bath penetration, spent potlining, SO, NO_x, and in the elimination of CO, CO₂, and CF₄.



Project Description

Goals: Demonstrate advanced materials for inert anodes and wetted cathodes and an optimum design and process for smelting aluminum by designing, constructing, and operating advanced bench scale and pilot-scale aluminum production cells.

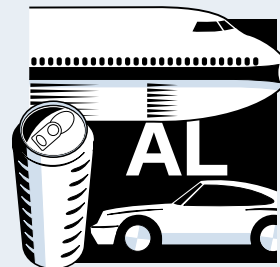
The objective is to assess the long-term chemical stability of oxygen-producing ceramic metallic anodes and stable aluminum wetted cathodes for energy efficient electrolytic production of aluminum. The project will also describe how the anode and cathode materials are produced cost effectively, and will define the optimum operating parameters for the production cell.

Progress and Milestones

- Design commercial production cell considering advanced concepts.
- Develop improved anodes and enhanced anode connections.
- Scale-up improved cathodes and improve vertical cathode connections.
- Improve sidewall barrier and lid of the production cell.
- Model the cell itself, cell current efficiency, and anode wear.
- Design, build and bench test the new production cell.
- Design, build and bench test pilot-scale production cell.
- Optimize design of the commercial production cell.

Commercialization Plan

The drastically reduced energy costs are expected to drive the rapid commercialization of this technology once the benefits are proven. After this project is complete, Alcoa plans to construct, operate, and autopsy two commercial scale tests. If the outcome of this project and the commercial scale tests are successful, the technology is expected to be commercialized in early 2005.



PROJECT PARTNERS

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